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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/677,173	10/02/2003	Dario Gil	MIT9996	8321

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EXAMINER	
CHACKO DAVIS, DABORAH	

ART UNIT	PAPER NUMBER
1756	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/677,173	**Applicant(s)** GIL ET AL.	
	Examiner Daborah Chacko-Davis	**Art Unit** 1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 April 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *13-20* is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 26, 2007, has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 3, and 5-7, are rejected under 35 U.S.C. 102(b) as being anticipated by U. S. Patent No. 5,218,471 (Swanson et al., hereinafter referred to as Swanson).

Swanson, in the abstract, in col 2, lines 6-24, lines 53-68, in col 4, lines 46-68, in col 5, lines 1-7, in col 7, lines 1-24, discloses forming a diffractive element (forming binary amplitude masks or binary optical devices) on a substrate, by performing an e-beam lithography (e-beam lithography is a maskless lithography) on the resist coated substrate (chromium coated substrate) at a first portion (a first exposure) to form a first pattern, performing e-beam lithography on a different portion (a second exposure) to form a second pattern resulting in a multi level optical element (first resist pattern having a thickness different than second resist pattern, the chromium coated substrate is exposed to e-beam lithography to form a diffractive element with a number of different levels i.e., N no. of masks formed) (claims 1, and 3). Swanson, in col 5, lines 4-15, and 32-45, discloses that the first resist area (first pattern) and the second resist area (second pattern) include SiO_2 and are transparent (quartz substrate) (claims 5-6). Swanson, in col 5, lines 46-48, and lines 57-58, discloses that the first and second pattern area form a part of the Fresnel zone plate (claim 7).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 2, 8, 10-12, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,218,471 (Swanson et al., hereinafter referred to as Swanson) in view of U. S. Patent Application Publication No. 2005/0032378 (Yu et al., hereinafter referred to as Yu).

Swanson is discussed in paragraph no. 3.

Swanson, in the abstract, in col 2, lines 6-24, lines 53-68, in col 4, lines 46-68, in col 5, lines 4-68, in col 7, lines 1-24, discloses forming a diffractive element (an array of focusing elements) on a substrate, by performing an e-beam lithography (maskless lithography) on the resist coated substrate at a first portion (a first exposure) to form a first resist pattern, performing e-beam lithography (maskless lithography) on a different portion (a second exposure) to form a second resist pattern resulting in a multi level optical element (claims 10-11).

The difference between the claims and Swanson is that Swanson does not disclose that substrate (or resist upon which exposure is performed) is formed of hydrogen silsesquioxane (HSQ) (claim 2). Swanson does not disclose that the first and second pattern area form a part of a blazed zone plate (claims 8, and 12).

Yu, in [0031], discloses that an e-beam resist material (HSQ) is used as the patterning material to form multilevel structures Yu, in [0019], and in [0040], discloses patterning the different areas in the patterning material to form nanostructures having a precise zone plate pattern, wherein the zone plates includes blazed zone plates.

Therefore, it would be obvious to a skilled artisan to modify Swanson by employing e-beam resist material as the substrate material because Yu, in [0031], teaches that the e-beam resist material can be used as the patterning material and can also be used as the sublayer to the patterning layer, and Yu, in [0036], discloses that e-beam resist material is suitable as the patterning material because it is etch-resistant as a result of which the particle track under it is not etched. It would be obvious to a skilled artisan to modify Swanson by using the first and second pattern areas to form blazed zone plates as taught by Yu because Yu, in [0040], discloses that multilevel patterning results in zone plates with a blazed profile and enables its use in x-ray spectral region.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,218,471 (Swanson et al., hereinafter referred to as Swanson) in view of U. S. Patent No. 5,900,637 (Smith).

Swanson is discussed in paragraph no. 3.

The difference between the claims and Swanson is that Swanson does not disclose that the exposure process involves the use of x-ray lithography (claim 4).

Smith, in col 3, lines 65-67, discloses performing the exposure using a beam source of x-ray.

Therefore, it would be obvious to a skilled artisan to modify Swanson by employing the x-ray source as the exposure source as taught by Smith because Smith, in col 3, lines 26-35, discloses that using x-ray as the exposure source enables the achievement of the highest possible resolution, with minimal attenuation.

7. Claim 9, is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 5,218,471 (Swanson et al., hereinafter referred to as Swanson) in view of U. S. Patent No. 5,794,023 (Hobbs et al., hereinafter referred to as Hobbs).

Swanson is discussed in paragraph no. 3.

The difference between the claims and Swanson is that Swanson does not disclose that the Fresnel zone plate is an apodized zone plate (claim 9).

Hobbs, in col 3, lines 17-34, in col 4, lines 32-36, discloses that the Fresnel zone plate is apodized.

Therefore, it would be obvious to a skilled artisan to modify Swanson by employing the method of apodizing the Fresnel zone plate to form a apodized zone plate as taught by Hobbs because Hobbs, in col 2, lines 32-45, discloses that the changes in the radiation beam used for exposure is controlled in such as way to cause apodization, and form a diffraction pattern having a Fresnel amplitude zone plate pattern to form an apodized plate so as to advantageously realize an enhanced capability.

Allowable Subject Matter

8. Claims 13-20, are allowed (see remarks filed August 18, 2006).

Response to Arguments

9. Applicant's arguments filed April 26, 2007, have been fully considered but they are not persuasive. The 102 and 103 rejections made in the previous office action are maintained (paper no. 20061113).

A) Applicants argue that Swanson does not disclose that each of the lithography step involves a maskless lithography.

Swanson, in col 4, lines 60-66, discloses using an e-beam tool i.e., a first lithographic technique to form multi-level diffractive elements (a diffractive element with N level of masks formed) i.e., e-beam exposures are performed without the use of mask (or maskless lithography) (a first set of exposure on a first area and a second set of exposure on a second area) are performed with different sets of exposure characteristics, and the multilevel in the DOE (diffractive optical element) is formed due to the varying depths of exposure (resulting in different thicknesses in the first exposure area and the second exposure area).

B) Applicants argue that neither Yu et al., nor Swanson et al., disclose using maskless lithography and conducting lithography on a substrate using hydrogen silsesquioxane.

Swanson et al., teaches performing electron beam lithography on the substrate to be processed to form a diffractive optical element. Swanson et al., is not depended upon to disclose the use of silsesquioxane as the patterning material. Yu et al., in [0016], and [0031], discloses that the wafer is coated with e-beam resist material i.e., HSQ or silsesquioxane material, and that the patterning material (HSQ or e-beam resist) is patterned via electron beam lithography i.e., maskless lithography.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published

applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd
June 20, 2007.